

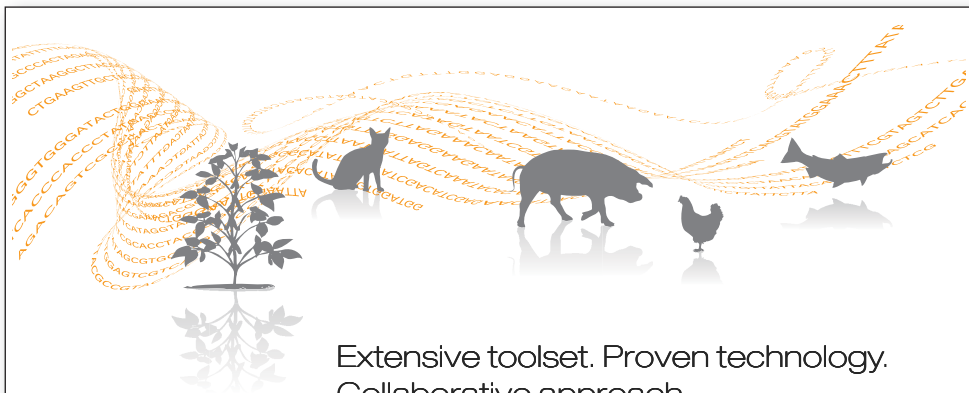
“New technologies and new challenges for breeding and herd management”



General Assembly and annual workshop of ICAR 2011

***Bourg-en-Bresse, France
June 22nd to 24th 2011***





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In the 21st century, animal production has to face several economic environmental and social challenges.

Animal recording in farm is the foundation of genetics and herd management. It's a capital tool to face the challenge and find success.

International exchanges of technologies and genetic material have always been the fuel of animal production development all over the world. It's the reason why ICAR activities are important, by sharing experiences, producing renowned guidelines and above all, supporting its members activities.

FGE is proud to welcome its 48 countries members and their delegations, to the 2011 General Assembly and all the participants for the international workshop.

On behalf of the board of France Genetique Elevage and the 2011 Steering Committee, I wish you successful exchanges all along these 3 days.



A handwritten signature in dark ink, appearing to read 'A. Merlet', with a long, sweeping horizontal line extending to the right.

**Albert Merlet,
President France Genetique Elevage**

Program

Sub committees

working groups and satellite meetings



All meetings are in the Mercure Hotel, 10 Avenue de Bad Kreuznach, 01 000 Bourg-en-Bresse,
except Artificial Insemination & Relevant Technologies WG
and General Assembly of FIEA which are at Ceyzeriat

Monday, June 20th

8:00 - 12:00	• Animal identification SC	K. Ilves
13:30 - 17:30	• Interbeef WG	B. Whickam
	• Artificial insemination & relevant technologies WG	L. Journaux
	• Animal recording data WG	E. Rehben
	• Animal identification SC	K. Ilves

Tuesday, June 21st

8:00 - 12:30	• Artificial insemination & relevant technologies WG	L. Journaux
	• Animal recording data WG	E. Rehben
	• Analytical Workshop of MA SC	O. Leray
	• Interbeef WG	B. Whickam
	• EHRC European Championship WG	J. Crettenand
	• ICAR board	A. Rosati
13:30 - 18:00	• General Assembly of FIEA (French federation of data centers)	R. Rognant
14:00 - 15:30	• ICAR board	A. Rosati
	• Parentage recording WG	S. Harding
	• Dairy and meat milk recording in goats WG	Z. Barac
	• Analytical Workshop of MA SC	O. Leray



Program

General assembly & workshop

Wednesday, June 22nd

8:30 - 10:30

- **General Assembly of ICAR**

Coffee break

11:00 - 12:30

- **Welcome and presentation of French Livestock**

Lunch

13:30-15:45

- **New technologies in performance recording**

- > Introduction *Kaivo Ilves*
- > Current situation-issues and challenges-on data exchange in agriculture in the EU *Henri Holster*
- > The use of electronic identification for small ruminants in France *Louise Marguin*
- > Cattle RFID opportunities and challenges *Pieter H. Hogewerf*
- > Recording claw disorders electronically *Johannes Frandsen*
- > Silent Herdsman : the heat detection system for the 21st century *Ivan Andonovic*
- > FCEL at the heart of the development of performance milk recording *David Saunier*
- > Lactocorder system in France *Tilman Hoefelmayr*
- > Conclusions *Kaivo Ilves*

Coffee break

Program

General assembly & workshop



Wednesday, June 22nd

16.15-18.15

- **Phenotyping of complex traits**

- > Introduction *Marco Winters*
- > Global perspectives on trait ontology and phenotyping of livestock : examples from functional genomics and modeling in beef-producing animals *Jean-François Hocquette*
- > ATOL : A new ontology for livestock *Catherine Hurtaud*
- > Registration of health traits – strategies of phenotyping, aspects of data quality and possible benefits *Christa Egger-Danner*
- > Phenotyping the reproduction function in cattle : inputs from functional genomics and epigenetics *Claire Ponsart*
- > Phenotyping that maximizes the value of genotyping *Mike P. Coffey*
- > Conclusions *Marco Winters*

18.40-22.00

- **Evening at Ceyzeriat : local zootechnical center**

(AI center, milk recording, analyze laboratory, data center, beef commercial organisation ...)



Program Workshop

Thursday, June 23rd

08:30-10:30

• New genomic tools for selection and management

- > Introduction *Reinhard Reents*
- > State of the art of genomics for selection *Didier Boichard*
- > Plans of the future activities of Interbull in genomics *Joao Dürr*
- > Potential applications of genomic information beyond breeding *Marco Winters*
- > Research and development in nutrigenomics *Mark Gaffney*
- > Conclusions *Reinhard Reents*

Coffee break

11:00-12:30

• Milk analysis : new technologies, developments, interest criteria for man, breeding and management

- > Introduction *Olivier Leray*
- > Optimir *Frederic Dehareng*
- > Harmonisation of milk analysers for fatty acid determination by FTMIR - An essential step prior to collective data use *Olivier Leray*
- > Calibration monitoring and control approach for multi devices analytic system performing in rough environment *Gil Katz*
- > Applied FT-IR is a highly potential technology for uncovering new valuable herd management and breeding information *Steen Kold-Christensen*
- > Conclusions *Olivier Leray*

Lunch

Program Workshop



Thursday, June 23rd

13:30-14:55

• Certificate of Quality workshop

- > Introduction *Franck Armitage*
- > The benefits of the Certificate and lessons learnt *Folkert Onken*
- > The experiences of an auditor and applicant *Pavel Bucek*
- > The role of the auditor and lessons learnt *Franz Schallerl*
- > The benefits of the Certificate to our organisation *Martina Rafajova*

14:55-16:45

• New approaches in management of recording activities how to demonstrate benefits of herd recording ? how to make our business attractive ?

- > Introduction *Jay Mattison*
- > Farmers requests for new skilled services *Jean-Pierre Lemonnier*
- > Herd performance benchmarks : graphic presentations of dairy farm performance relative to cohort herds, *Peter D. Giacomini*
- > Software offer from French farmers' organizations to support livestock activities *René Rognant*
- > Feedstuff NIR analysis in farm to growth herd recording activity *Alberto Barbi*
- > Global management of milk recording service with FIDOCL *Jean-Marie Nicolas*
- > Conclusions *Jay Mattison*

18:30-23:00

• Event at Epeyssoles castle in Vonnas



Program

Technical tours

Friday, June 24th

08:00-17:30

Tour 1

- **Milk production in middle mountains and cheese with quality mark ; Poligny : the French reference lab for ICAR**

- > Mont rivel dairy cheese (Vannoz)
- > Dairy breeding (Vannoz)
- > Poligny
- > Jurafllore cheese cellars

Tour 2

- **Milk production in plains with high productivity farming systems**

- > GAEC des Cours (Domsure) - Automatic Milking sheds (robotic milking)
- > GAEC de la Seillette (St Paul de Varax) - Rotary Milking sheds
- > GAEC MOREL (St Cyr-sur-Menthon) - Milking parlour

Tour 3

- **Diversified beef production system in Charolais breed with high economical performance**

- > Slaughterhouse of the company BIGARD (Cuiseaux)
- > Charolais Breeding (Curciat Dongalon)
- > Breeding EARL du Bon Repos (Viriat)

Tour 4

- **Goat with cheese farming with wine production in the Macônais region. Electronic Identification for small ruminants**

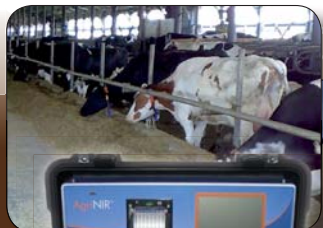
- > Pré chevrier GAEC (Treffort Cuisiat)
- > Agricultural high school (Macon Davaye)
- > Goathouse « les Filletières » (Chenoves)

From 18:00

- **16th National Montbeliarde Show**

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More than
16,000 LactoCorder® are
already in daily use
for Official Milk Recording,
with considerable positive
effects such as efficiency
and reduced labour costs.

The LactoCorder creates
a solid basis today for better
decision-making tomorrow
through its unique array
of important background information.

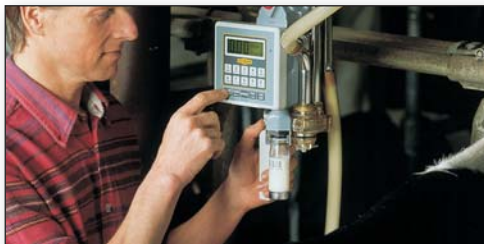
It offers the best basis for
ensuring milk quality, good health
and economic success.



LACTOCORDER

SWISS QUALITY

www.lactocorder.com



LactoCorder® - A new dimension in Official Milk Recording: simple, efficient, safe, informative.

Based on its ingenious concept developed especially for Official Milk Recording, the LactoCorder **permits greater rationalisation**. It saves on labour and reduces costs. The **mobile device** is optimally suited for A-methods as well as for B and C Controls, **without security losses**.

- **Menu-driven** for ease of operation (German/English/French)
- Samples are taken fully automated and on line **directly into the sample bottle**, in addition **bar code reading**
- **Minimal vacuum loss** (according to the ICAR test only 36% of the DIN/ISO norm)
- **Inclinometer** for continuous data compensation
- **Maximum measurement quality**, irrespective of milking and stall system
- **Simple and secure data handling** by infra-red transmission to and from the credit card-sized **DataPack**

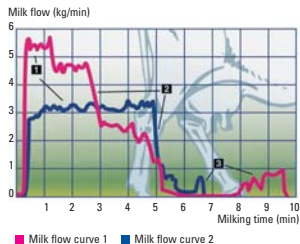
On top of the standard results (milk yield and sample) every Milk Recording with the LactoCorder regularly makes available a whole range of electronically stored complementary data at no extra cost or effort:

- High resolution **milk flow curve** (measurements every 0.7 seconds)
- Curves for **electrical conductivity** and **milk temperature**
- All **classification data** (operation number, cow number, bar code number, lactation status, date, time, etc)
- Integrated special function for **cleaning** (to generate maximum turbulence)
- Possibility of **detailed monitoring of the cleaning function** of the milking installation
- Possibility of **remote control** of measuring system and quality
- Highly differentiated **automatic analysis** of measurement curves (20 parameters for the milk flow curve alone)

The unparalleled stream of valuable data from the LactoCorder opens up a **whole new spectrum of practical information** for farmers and advisory, veterinary and breeding services as well as other organisations related to Official Milk Recording.

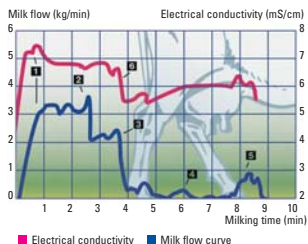
LactoCorder® - The system with the future built-in

If you would like more information, please pay us a visit at:
www.lactocorder.ch



Relevant milking parameters like :

- (1) level and duration of peak flow (2) quarter distribution (3) machine stripping and (4) milking time are provided regularly by the LactoCorder with no additional cost or effort.



Thanks to high resolution milk flow curves, the quality of the milking routine and milking equipment can be evaluated, for example: (1) lack of pre-stimulation (2) air leakage, (4) overmilking and (5) machine stripping. Furthermore, (6) changes of electrical conductivity in connection with (3) the flow stopping of single quarters, can give additional indications of udder disease.

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WMB

SESSION 1

New technologies in performance recording



Current situation-issues and challenges- on data exchange in agriculture in the EU

In the AgriXchange EU project, a system for common data exchange in the agricultural sector is developed. Analyses of the current situation concerning data exchange in agriculture in EU member states is part of the project.

Issues and challenges on current data exchange in the EU are discussed. Results are coming from the investigating the state of the art – with a focus on cattle and arable farming – which was carried out in 27 EU nations and Switzerland. The investigating has been done partly by quantitative and qualitative inquiring experts from the European countries or regions. For this 6 focus groups based on European regions had been set up. Agricultural characteristics and farm automation levels are explained to understand some main developments and differences. Data exchange is explained based on the levels of data integration : process, data and physical layer. Conclusions and recommendations for business and policy are given. Where possible special attention to (relation with) the ICAR inventory on data exchange will be made.

Henri Holster - NL

B. Fusai

The use of electronic identification for small ruminants in France

To follow the new European rules of identification, all the farmers must identify the new born lambs and young goats. But in France, many farmers want to use this new way of identification with the feeding, weighing, milking automates and also for the performances' controls as soon as possible. So they tag in one time all the mothers of heir flock with electronic ear-tags or pastern tags. The automation to collect data for the management of the herd or for the trade of the products bring more reliable information in real time. A catalog with all the electronic devices available in France can help these farmers to choose their equipment linked with their software. Some advices can also help them to adapt their equipment to the known constraints to get some benefits of the automation.

Louise Marguin - FR

*J.Holtz
A.Debroux
S.Duroy
M.Dang*



SESSION 1

New technologies in performance recording

Cattle RFID opportunities and challenges

Several countries have livestock identification schemes based on radio-frequency identification (RFID) in place, e.g. for cattle in Australia, Canada and Denmark and for sheep and goat in most EU countries. For all mentioned identification schemes, positive impacts on farm management and farm process control are reported.

On the SIMA2011 in Paris, DGSanco announced to be working on a proposal allowing the use of RFID in national cattle identification schemes. The introduction of cattle RFID will be an opportunity especially for countries with a low degree of process automation. In those countries, the introduction of RFID can speed up the application of farm automation systems. In countries with a high degree of process automation, the challenge will be to implement regulations in such a way that food safety (traceability) requirements and requirements in relation to process automation are both guaranteed. The biggest challenges will be to modify the identification systems in such a way that it can make use of the RFID devices instead of e.g. neck belt transponders.

The following aspects are a challenge: if countries decide to introduce voluntary cattle RFID systems, the farmers might be faced with a mixed population with RFID tagged and visually tagged animals. What to do if farmer wants to use RFID in his farm management and he has bought animals that are not RFID tagged? In mandatory system, it might be that several methods of RFID identification will be allowed. How to manage if farm automation is based upon a certain type RFID device (ear tag, bolus, injectable or leg tag transponder) and the farmer is buying animals that are identified with a different type of RFID device ? Even in a situation where only one type of RFID is allowed (e.g. ear tag transponder) the farmer can be faced with the situation that the performance of some RFID tags is insufficient to be used in combination with farm automation equipment.

For most of the mentioned problems, there is a solution, but can those solutions be applied without introducing food safety risks ?

Pieter H. Hogewerf - NL

SESSION 1

New technologies in performance recording



Recording claw disorders electronically

Abstract Claw diseases are an increasing and costly problem in Danish and probably many other herds. Danish Cattle found that good information about the “true” claw health status from claw trimmings was a prerequisite for meeting the challenges with increasing claw health problems in the herds. To get the needed registrations, Danish Cattle Federation has developed software to register clinical observations on (dairy) cattle’s claws during hoof trimming. The software is developed to be operated from a tablet PC with a touch screen attached to the hoof trimmers box. The Claw Registration offers the following possibilities:

Johannes Frandsen - DK

*P. Nielsen
G. Aamand*

- . Registration of 36 different clinical observations, mild and severe.
- . Treatment (done by the hoof trimmer).
- . Information about latest observation(s) and treatment(s).
- . Data exchange to the Central Cattle Database.
- . Different kind of outputs and analyses.

Since the release April 2010, the usage has increased a lot. Now, April 2011, about half of the hoof trimmers in Denmark use the claw recording system, about 290 000 trimmings has entered the Cattle Database. The claw trimmer data is used for daily management of claw health . A joint Nordic Genetic evaluation of claw health started on 2nd May 2011, and the claw health index will be included in the Nordic Total Merit index (NTM) in August 2011.



SESSION 1

New technologies in performance recording

Silent Herdsman : the heat detection system for the 21st century

As a result of the low cost and wide availability of digital processing, storage and communication technologies, it has now become cost effective to monitor and capture representations of the condition of individual animals, to a level of detail that has been previously unknown. This presentation reports on the development of the “Silent Herdsman” platform, a new generation of animal monitoring systems, that allow data to reach a farm control system in a timely fashion. The solution, which uses a collar tag as its foundation, can be considered for both indoor and outdoor farm environments and at this time, is centred on predicting the onset of heat in dairy cattle.

Ivan Andonovic - UK

T. Craven

A. Mac Dougall

FCEL at the heart of the development of performance milk recording

The breeding environment is changing at all levels, expanding herd size, cost control records or control measures of performance, traceability of the data, immediate valuation in the farms.

France Conseil Elevage network has implemented more efficient practices to meet and to prevent new expectation of farmers, using advanced technologies. (Electronic milk meter, PDA, GPRS, RFID, computer interfaces...)

-Implementation of the sampling and measure of milk with milk-meter electronic type Lactocorder of WMB and EMM Trutest.

-Use of Personal Data Assistant for the control of performance, elimination of the manual seizure, Identification of animals and vials by RFID, dematerialization of the exchanges.

-Integration of multiple data sources through data bases (farmers, other stakeholders in livestock), refunds faster results to farmers through various electronic channels.

-Exchange with the software Breeders robot, parlor, others and Livestock Organizations Council via the interface Ori-Automate.

-The presentation will describe these new organizations working on cattle but also goats in the France Conseil Elevage network.

David Saunier - FR

C. Lhomme

L. Mériaux

SESSION 1

New technologies in performance recording



Lactocorder system in France

After the first tests and applications of the Lactocorder System on French territory 10 years ago, there are nowadays about 20 milk recording associations working with more than 2000 units on a daily basis.

The majority of the cases is official milk recording in bovine species as well as in goats. The adoption of the control B and C (CZ) is 70% by now and is constantly increasing. Naturally, from the host of additional data registered by the Lactocorder System at every single milk recording, automatically and without any additional cost or effort, and processed by the userfriendly evaluation program LactoPro, a distinct selection (milk flow curves, measuring parameters, wash monitoring of the milking installation, etc...) is afterwards transmitted to the breeder who finds therein an invaluable help.

In order to simplify the recording for the expanding sizes of the herds, WMB has been engaged in the last 5 years in developing the automation of the identification of the cows and the goats by the use of animal chips RFID (official or non-official).

To-day we are able to work with electronic identifiers affixed to the leg (electronic belt tied) or to the ear. This in order to facilitate the official milk recording maximally.

After the great satisfaction of the Lactocorder users, we eventually have taken up the challenge to develop the Lactocorder System further to specifically enable the official milk recording in dairy sheep. It is a new challenge which we are certain to achieve in a short run.

Tilman Hoefelmayr - CH

D. Saunier

C. Lecomte

D. Gaumont



POSTERS - Session 1

New technologies in performance recording

Management of heat detection using video monitoring : a study in the Montbéliarde and Abondance breeds

During 3 consecutive winters (2007 to 2009), an experiment was conducted in a 80 cows dairy herd (mainly Montbéliarde and Abondance breeds, Centre d'Elevage Lucien Biset, Poisy, France), in order to evaluate a video-watching system for oestrus detection. The detection was based on the observation of standing to be mounted. About 30 dairy cows, housed in two straw litter free stalls, were included in the study each year.

The four fixed cameras were connected to a computer equipped with specific software allowing movement detection. This system allowed the continuous observation of cows, as well of the storage of video motions. Dosages of milk progesterone were performed twice a week. The progesterone profiles made it possible to detect ovulatory periods (OP). Data obtained by visual oestrus observation were also used.

Our video system allowed the detection of 82% of the ovulatory periods, associated with standing to be mounted behavior ($n=168$). Only 6 to 12% of the OP were not accompanied by detected specific behaviour. With the visual method, detection rate was the same, although different cows were detected. 4 to 16 minutes (mean 10mn) were necessary to daily to analyse stored pictures. When compared to the four periods of 10mn for visual detection, we conclude that the video-survey provides a significant gain of time. We can even spend less time : when setting the detection rate on 70% in 2009, we spent 3 mn less for the same result, and when watching only 1 camera instead of 2, we still detect 69% of the oestrus cows.

Thierry Hetreau - FR

O. Giroud

C. Ponsart

J. Gatien

P. Paccard

F. Badinand

P. Bruyère

SESSION 2

Phenotyping of complex traits



Global perspectives on trait ontology and phenotyping of livestock : examples from functional genomics and modeling in beef-producing animals

We are entering a period where large-scale projects in life science are being developed, driven by the desire to explore biology as a whole rather than in pieces, to establish reliable relationship between genotype and phenotype, in a perspective of sustainable livestock breeding. This implies the use of the latest methods and technology for phenotyping and the development of large databases for modeling. In this context, accurate, precise, and comparable phenotypic information is critical for gaining an indepth understanding of the relationship between genes and phenotypes including the development of genomic selection. So far, it is indeed difficult or extremely difficult to combine genotype-phenotype data from multiple databases due to variability in phenotyping procedure and lack of breeding environmental data. As a consequence, it is necessary to define a common language developing an ontology which to univocally define traits and phenotypes, and later on, associated methods to capture relevant and comparable differences between animals. The ATOL (Animal Trait Ontology of Livestock) project is contributing to provide the organization and knowledge necessary for engaging livestock communities in the process of creating comprehensive phenotyping resources. This also implies a network of coordinated, advanced, and standardized phenotyping infrastructures, such as facilities for measuring well-known or new relevant traits by classic approaches, imaging techniques, and/or comprehensive description of molecular and metabolic patterns to develop strategies for multi-level data integration. Examples of such projects in functional genomics and in modeling will be given for meat-producing cattle.

Jean-François
Hocquette - FR

C. Capel

M. Barbezant

PL Gastinel

PY. le Bail

P. Monget

JL Peyraud

Highly Reliable and Accurate Dairy Components Analysis



Milk Chemical Composition + Somatic Cells

Bentley Combi FTS:

Rapid and **accurate** determination of milk chemical composition (fat, **protein**, lactose, solids,+++) by FTIR spectroscopy, and somatic cells content by flow cytometry

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Rapid and **accurate** determination of raw milk Total Flora (cow, sheep, goat and buffalo) by flow cytometry

Optimize your productivity:

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OTHER BENTLEY PRODUCTS:



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The Bentley DairySpec FT is a versatile infrared analyzer for the rapid and **accurate** determination of milk and dairy product chemical composition. This instrument uses the latest in FTIR technology to deliver highly accurate dairy components analysis.



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INSTRUMENTS**

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SESSION 2

Phenotyping of complex traits



ATOL : a new ontology for livestock

Technological advances in biology now allow the mass collection of data which make it possible to finely describe important biological functions. These data contribute to the thorough knowledge of the unique characteristics of each individual, i.e its phenotype, as a result of the expression of its genome and its regulation particularly by its environment. The characterization of each phenotype involves a computer data processing which highlighted the urgency to have a standardized and explicit language, defining without ambiguity the traits to which a variety of users (geneticists, physiologists, biochemists, producers, archivists...) could refer to. The construction of this language requires the use of ontologies, structured collections of terms and concepts within a definite information field organized to meet the users' needs. To-day, no ontology is specifically dedicated to animal breeding (fishes, poultries and mammals). In this context, INRA (France) in collaboration with USDA (USA) set up a program named ATOL (for "Animal Trait Ontology for Livestock"), aiming at defining and organizing the phenotypical characters of livestock integrating the current concerns of the society while focusing on productions of interest: adaptation and stress, feed and diet, nutrition and feed efficiency, growth and meat production, mammary gland and milk production, reproductive system and fertility. ATOL should help establishing more precise genotype/phenotype relationships while considering environmental effect on phenotype. This program should then open the way (using semantic tools) to a systemic, predictive and not only multicriteria approach of animal selection.

Catherine
Hurtaud - FR

J. Bugeon

O. Dameron

A. Fatet

I. Hue

MC. Meunier-Salaün

M. Reichstadt

A. Valancogne

J. Vernet

J. Reecy

C. Park

PY. Le Bail

SESSION 2

Phenotyping of complex traits

Registration of health traits – strategies of phenotyping, aspects of data quality and possible benefits

Health traits have become increasingly important worldwide based on economics, animal welfare concerns and consumer demands for healthy and natural products. The limited availability of reliable phenotypes for health traits often constrains breeding for disease resistance under both traditional and genomic selection schemes, the latter of which requires high-reliability breeding values of bulls as inputs. Experiences from several countries show that acquiring good phenotypes of health traits is challenging. Two different approaches are generally used for registration of health traits: the Scandinavian countries and Austria focus on diagnostic data from veterinarians, whereas other countries work mainly with producer-recorded health information. In both cases, the standardized recording of health events is important. However, the level of detail of recording and methods of analysis may differ between involved parties, including farmers, veterinarians, and breeders. International comparisons of health data analyses can be facilitated by using a common standard for diagnosis and recording. Furthermore, data quality is crucial and requires careful attention to detail. A precondition for the establishment of a successful phenotyping standard is the continuing motivation and commitment of all partners involved. To achieve this, participation in the recording system should require little additional effort and bring about obvious benefits. Compilation of health reports allows monitoring and improvement of herd management in the short term, and breeding values for health traits provide the basis for general health improvement in the long term. Significant progress with regard to animal welfare, and production of high-quality food will be positively recognized by the public, and is in line with the EU animal health strategy, stating that prevention is better than cure. Successful approaches to phenotyping of health traits, recommendations for data validation, and an outlook of the possible benefits of comprehensive recording of health traits will be presented and discussed. The presentation outlines the draft of the ICAR guidelines for recording, evaluation and genetic improvement of health traits.

Christa
Egger-Danner - AT

K. Stock

J. Cole

A. Bradley

J. Pryce

N. Gengler

L. Andrew

E. Strandberg

SESSION 2

Phenotyping of complex traits

Phenotyping the reproduction function in cattle: inputs from functional genomics and epigenetics

The reproductive function consists in a complex mosaic combining different phenotypes from male, female components, interacting together. Following the development of competent gametes, interaction between male and female cells starts with the ability of the female tract to transport, select and prepare spermatozoa to fertilization, then to ensure a maternal environment facilitating fertilization and early embryo development. The cross talk between an embryo and its maternal environment leads then to successful early embryo development and implantation, coming in a range of space-time continuum, forming a black box in which it is difficult to isolate precise events and functions involved in pregnancy success or failure. In the Holstein breed, recent epidemiological studies confirmed the high prevalence of early embryo death and the impact of genetics, partly due to negative correlation with milk production. At the same time, new approaches of phenotyping such as transcriptomics and proteomics have been applied to gametes, embryos and maternal reproductive tract, which may allow to open this black box and to investigate mechanisms and genes involved in the different phenotypes. “Omics” approaches are completed by studies of epigenetic control of gene expression, indicating that such modifications (not related to genome sequence) influence pregnancy, with long term effects on offspring. Projects funded from ANR agency (GENANIMAL) and APISGENE since 2003 have been dedicated to the early stages of pregnancy, implantation and interaction with energy metabolism. Integrated analysis of the previously described results will improve genomic selection of fertility, allowing to identify the most pertinent genes and events related to the success of AI and to develop different techniques aimed at improving cattle management.

Claire Ponsart - FR

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P. Salvetti

A. Capitan

B. Grimard

P. Humblot

O. Sandra

P. Mermillod

SESSION 2

Phenotyping of complex traits

Phenotyping that maximizes the value of genotyping

High density bovine SNP arrays offer immense potential benefits to the entire agricultural industry. In dairy cattle breeding, the immediate benefits arise from utilizing existing phenotypes to train genotypes and create prediction formulae. These so called SNP Keys can be used to predict the genomic breeding value of young animals with no phenotypes. This paper will highlight two key components which have to be considered when implementing a genomic breeding program.

1°) The ability to speed up genetic change requires careful consideration of the selection objectives. As with existing breeding programs, those traits that have the highest accuracy indexes usually progress the quickest. Lower accuracy traits (which can be due to lower heritability or poorer recording quality) progress at a relatively slower rate. If that discrepancy continues under genomic selection, we could end up with health and fertility problems much faster unless selection strategies take account of this. Therefore broader breeding goals, encompassing a wider range of health and fertility traits become even more important in a genomic selection scheme. However, correlated traits with unobserved recording systems (e.g. diseases) will not be able to be considered adequately and may deteriorate faster.

2°) Historically, performance records have been gathered on-farm for management purposes and then utilized afterwards for genetic evaluations. Perhaps in a genomic selection program, a different model should be used to maximize the value of genotypes. For example, performance recording could be paid for by the national body (representing the parties interested in genetic improvement of the national herd) in a small subset of herds that contractually provide the high quality phenotypes required for training the genotypes and creating the next generation of SNP keys. This would especially apply to novel traits that would not normally be recorded generally e.g. feed intake, milk progesterone, mastitis bacteriology, Johnes, methane emissions, etc... Illustration of number of herds and records required for various levels of heritability will be discussed.

Mike P. Coffey - GB

*R. Mrode
M. Winters*

POSTERS - Session 2

Phenotyping of complex traits



Phenotyping pregnancy failure occurring within 90 days following first postpartum insemination in Holstein cattle and relationship with fertility breeding value of bull fathers

This epidemiological study aimed to investigate pregnancy failures occurring within 90 days following first postpartum insemination (AI) in Holstein cows according to cow fertility breeding value (FERbv) of 12 bull fathers, which were selected according to their fertility QTL status on chromosome 3. A total of 4239 Holstein daughters were inseminated and submitted to the following phenotyping protocol : progesterone (P4) concentration was determined on the day of AI (Do) and 18 to 25 days later; then two pregnancy checks were performed using ultrasonography 45 and 90 days following AI.

Combining these observations, 4 different chronologies of pregnancy failure were described and subsequent failure incidences were estimated from 3508 cows : cows inseminated during the luteal phase (AI-LP, high P4 level on Do, 5.0%), no fertilization or early embryonic death (NF-EED, low P4 on Do and D18-25, 35.1%), late embryonic death (LED, low P4 on Do, high P4 on D18-25 with a negative pregnancy check on D45, 19.0%), and fetal death (FD, positive pregnancy check on D45 then negative on D90, 2.7%). Bull fathers FERbv ($CD > 0.95$) were classified into 3 groups (low : between -0.7 and -0.5 ; medium : between -0.1 and +0.3 ; high : between +0.5 and +1.0). Effects of bull fathers FERbv on pregnancy failure incidences were estimated using mixed models of logistic regression. Cows issued from bulls presenting low FERbv presented significantly higher NF-EED and LED rates than cows issued from bulls with medium FERbv ($OR = 1.3, p = 0.03$ and $OR = 1.4, p = 0.007$ respectively) or high FERbv ($OR = 1.3, p = 0.02$ and $OR = 1.7, p < 0.001$ respectively). No effect of FERbv was observed on FD and AI-LP rates.

This study confirmed the major impact of early embryonic death. The precise follow-up within 90 days following AI allowed to describe different fertility phenotypes and to quantify effects from bull father FERbv together with environmental sources of variation, management factors and individual characteristics. Further steps consist in interpreting genotype results from phenotyped cows, which should lead to identify new fertility QTLs.

Claire Ponsart - FR

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SESSION 3

New genomic tools for selection and management



State of the art of genomics for selection

Selection could be based on DNA polymorphism information of each animal. Nowadays, this information is obtained through chips providing individual genotyping results for many thousand SNP simultaneously. In the future, sequencing will become more affordable and provide a complete description of each individual genome. This polymorphism information could be used in genetic evaluation. The prediction is based on the genotype-phenotype relationships observed in a reference population and its accuracy depends on two parameters : the accuracy of SNP estimates (depending on the sample size and heritability), and linkage disequilibrium between SNP and QTL. Several genomic evaluation methods have been proposed, with varying underlying assumptions. The most popular, GBLUP, uses SNP information mainly to measure true relationships between animals. Other approaches, particularly Bayesian methods, try to detect the most predictive SNP. The French model for dairy cattle uses haplotypes instead of single SNPs, in order to maximize LD between markers and QTL. For each trait, 300-700 QTL characterized by 3-5 SNP are included in a QTL-BLUP. Large reference populations have been built by genotyping many progeny tested bulls and by sharing information in consortia such as the EuroGenomics initiative. Two major questions, the evaluation for new traits and the across population evaluation, need to be solved for a generalized use of genomic selection in all species and breeds.

Didier Boichard - FR

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MN. Rossignol

MY. Boscher

T. Druet

L. Genestout

L. Journaux

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S. Fritz



SESSION 3

New genomic tools for selection and management

Plans of the future activities of Interbull in genomics

Genomic tools have made dairy cattle breeding a very challenging activity lately. After decades of well-established progeny testing schemes being the worldwide standard for selection of artificial insemination bulls, affordable genotypes and comprehensive prediction models have mesmerized the industry with the promise of drastically lower generation intervals and reduced operational costs. The adoption of the new technology has been so fast and widespread that research was not able to provide all the answers yet. Interbull has provided a privileged forum for the necessary debates around the theme both in the annual meetings (starting in Niagara Falls) and in three especially organized international workshops. Discussions have included two dimensions of the topic : which are the tools that need to be developed in order to incorporate genomics into the solid genetic evaluation machinery that is already in place both nationally and internationally ; and how will the new developments affect international cooperation and consequently the equilibrium between exporters and importers of dairy genetics. Advances in methods have been significant due to an unparallel collective effort within the Interbull community, but there is still a need to clarify the best way of estimating reliability of genomic breeding values (GEBVs), avoiding double counting of phenotypic information when using foreign reference animals, avoiding pre-selection biases, validating prediction equations, estimating SNP effects with high density panels and, of course, providing reliable international comparisons of national GEBVs through Interbull. Main projects already implemented or under development at Interbull are : validation of GEBVs (GEBV test), Simplified Genomic MACE (S-GMACE), joint genomic evaluation of Brown-Swiss populations (Intergenomics) and common repository of international genomic information.

Joao Dürr
Interbull Center

R. Reents

SESSION 3

New genomic tools for selection and management



Potential applications of genomic information beyond breeding

The availability of Bovine high density SNP arrays has had a significant impact on the breeding industry over the last two years. With the cost of the technology rapidly reducing, and with higher and lower density SNP chips being marketed, accessibility and information is rapidly increasing. This means that other applications beyond breeding are now being considered. Immediate applications being proposed with the lower density SNP chips are 1) animal identification and parentage validation using around 100SNPs, and 2) female young stock screening using around 3000SNPs. Future applications for herd management will be developed, and might be applied to areas such as vaccine or drug sensitivity and specificity, feeding regimes tailored to the genetic profile, product traceability, individual mate selection. Critical to the success of these will be the collection of existing and new phenotypes combined with international standardization of trait definitions.

For the ICAR member, it's important to be aware of the potential applications this technology can bring, and start to consider how this can become part of the services provided to farmers.

Marco Winters - GB

MP. Coffey



SESSION 3

New genomic tools for selection and management

Research and development in nutrigenomics

Over the last decade, nutrigenomics has established itself as the new frontier of scientific research, covering a wide range of technologies, the ultimate aim of which is to elucidate the influence of diet on the genetic programming of cells and tissues. Considering the current global issues that are impacting on animal production, it is evident that a number of major challenges lie ahead. Issues such as the financial crisis, resource and energy strains, population growth and increasing food demand have placed a significant strain on production capacities. Additionally, the threat of viral pandemic, consumer demands for antibiotic-free foods and the increasing consumer desire for functional and value-added foods will require changes in our approaches to production and efficiency. To meet these demands, producers will need to reappraise their approach to animal nutrition. This will not only result in even more maximization of genetic potential through dietary and husbandry practices, but also in the exploitation and maximization of the genetic potential of the animal at a molecular level. Molecular potential exploitation is dependent on advances in the science of nutrigenomics, the main emphasis of which is the prevention of organ and whole-body equilibrium or homeostasis. This requires not only an understanding of, but the ability to manipulate a multitude of nutrient-related interactions at the gene, protein and metabolic levels. These new disciplines and their attendant technologies will redefine animal health and nutrition in the future. By focusing on gene expression and functional genomics, it is very likely that we will soon be able to gain a more definitive understanding of the importance of dietary intervention in nutritional strategies.

Mark Gaffney - IE

J. Zawadzki

R. Murphy

POSTERS - Session 3

New genomic tools for selection and management



Single-step Genomic Breeding Value for milk of Holstein in the Czech Republic

Milk production of 849693 primiparous cows with complete lactation (including pedigree 1 643 663 animals) from the period 1995-2010 was evaluated by traditional Animal Model (Breeding Value) and by Single-Step Approach of Genomic Evaluation (Genomic Breeding Value) procedures. In a Single-Step approach the pedigree-based relationship matrix was augmented by the genomic relationship matrix, constructed from SNP genotypes of R50K chip for 838 sires. Pedigree-based relationship matrix was compared with the genomic relationship matrix. Only lactation model and the first lactation were used for simplicity. Evaluation was calculated for whole data set and for subset of cows calved until year 2005. Within groups of animals (cows/heifers/proven bulls/young bulls/genotyped/ungenotyped) were calculated in dependency on the data sets differences and correlations between different procedures of predictions of breeding value. Between genotyped young bulls and their result in progeny test are propitious relations. By genotyping is partly corrected random Mendelian sampling in relationship matrix and it influence also the estimated differences of ungenotyped animals. For test of procedures were used families of programmes of BLUPF90 and DMU. Supported by the Ministry of Agriculture of the Czech Republic. (project N° Q1111A167)

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J. Splichal

M. Verner

J. Motycka

L. Vondrasek

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SESSION 4

Milk analysis : new technologies, developments, interest criteria for man, breeding and management



OptiMIR

The aims of the OptiMIR project are to improve the sustainability of the dairy sector by providing milk producers with tools enabling them to manage the cows fertility, feeding, health, pollutants, milk quality, etc... Milk records will be used in an innovative way :the entire MIR milk spectrum, including variations in its shape will be used as indicators of the cows'status for a range of characteristics :

Frederic Dehareng - BE

- 1) To reduce the costs of production through improved daily herd management (e.g. costs of feeding with energetic balance indicators, veterinary costs with early diagnosis of mastitis, costs of semen straws with insemination predictor, etc...
- 2) To bring opportunities to access competitive markets by measuring quality traits linked to higher added value (e.g. low cost measure of food label claims)
- 3) To improve impact on the environment(quantification of methane and nitrogen production).

OptiMIR is a 5 years project who involves 5 research units, 11 milk recording organizations, and 1 labs of 6 countries from the North West Europe (Belgium, France, Germany, Ireland, Luxembourg, United Kingdom), and is co-financed by the European Regional Development Fund interreg IVB program.



SESSION 4

Milk analysis : new technologies, developments, interest criteria for man, breeding and management

Harmonisation of milk analysers for fatty acid determination by FTMIR An essential step prior to collective data use

General objectives of PhénoFinlait program were to establish effective relations between the fatty acid (FA) milk composition of individual cow, goat and sheep, and usual factors influencing milk production (breed, feeding, genealogy) and to relate individual fatty acid phenotypes so-measured to genotypes, so as to establish appropriate levers applicable by farmers to orient milk fatty acid production.

Throughout more than a one-year period on 2009-2011, FTMIR analysis were periodically performed using 13 milk analysers located in 9 different laboratories on 1500 selected farms (1152 for cattle, 215 for goat and 160 for sheep) of various regions of France, in order to acquire MIR spectra and build up a national spectrum data base. Fatty acid compositions were then to be predicted from the central data base through specific sets of calibration equations, i.e. one set per species and type of analyser.

Since a unique calibration set could be applied to the spectra produced by several Milkoscan FT6000 need was to evaluate how far milk analysers could be comparable in predicting fatty acid composition. Therefore, repeatability and reproducibility were measured through an inter-laboratory study for a selection of 18 fatty acids and fatty acid families, putting in light high reproducibility figures and significant differences between Milkoscan FT6000 milk analysers.

To improve the precision performances, the possibility of a central calibration for FTMIR analysers for the future use of individual laboratories was successfully evaluated, and a centralized system based on deep-frozen and liquid control milk samples was implemented to monitor and align FTMIR analysers for fatty acid results during the whole period of the programme.

Whereas, for the whole period, raw predictions showed rather large and often multimodal distributions depending on the fatty acid (or fatty acid family), the applied corrections resulted in end in significant squeezes of fatty acid data populations characterized by single dominant modes.

Olivier Leray - FR

M. Ferrand

H. Larroque

JM. Astruc

M. Douguet

M. Brochard

K. Duhem

SESSION 4

Milk analysis : new technologies, developments, interest criteria for man, breeding and management



Calibration monitoring and control approach for multi devices analytic system performing in rough environment

A pragmatic viable approach is presented for evaluation, maintenance, surveillance and control of the global system for real time in parlor milk analysis. The approach considers a multiple sensor system (as opposed to the current method, the sensor is not a stand-alone analytic device but part of an automated data collection system) like the milk meter.

Since the analysis method is based on multiple sensors, it enjoys the advantage of the system conducting surveillance over itself. Between periodic calibrations, automated quality control can be implemented daily upon analysis of irregularities in the 3D matrix consisting the devices vector, time vector and the cows vector. Self-calibration of devices is achieved by filtering and neutralizing the effects of known built-in factors in the matrix influencing the precision of the measurement.

Gil Katz - IL

L. Lemberskiy-Kusin

E. Ishay

Applied FT-IR is a highly potential technology for uncovering new valuable herd management and breeding information

Fourier Transform Infrared (FT-IR) spectroscopy coupled with advanced chemometrics methods has proven a valuable tool, for not only conventional milk parameters, but also providing new information on fatty acids profiling and screening for ketosis and abnormal milk.

These findings are promising for uncovering new herd management information for optimizing herd as well as individual cow performance for practical farm procedures and in breeding programs.

Steen Kold-Christensen - DK



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Certificate of quality



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Many of the applicants have used the Certificate process to evaluate their activities dispassionately and it is known that the process has then been used internally to beneficial effect, in terms of management and efficiency. Conversely the auditors have taken back to their organisations lessons learnt and systems seen; this is a true symbiotic relationship. Certificates of Quality have been granted for the following categories to organisations in 30 countries, with some have received more than 1 Certificate and the originals renewed.



Identification	Production Recording	Genetic Evaluation	Other Certificates which have been awarded where the applicant's activity was specific.
Dairy cattle	Dairy cattle	Dairy cattle	Laboratory analysis
Beef cattle	Beef cattle	Beef cattle	Herdbook activities
Buffalos	Buffalos		Data processing
Goats (dairy and meat)	Dairy goats	Type classification	
Sheep	Dairy sheep	Meat sheep	

The role of auditor is crucial to the success of the Certificate of Quality programme. The auditor is not just an inspector, but should also be considered as an independent advisor where appropriate and also a person who will learn from the experiences of the applicant member. Auditors have been recruited from 17 countries.



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SESSION 5



New approaches in management of recording activities : how to demonstrate benefits of herd recording ? how to make our business attractive ?

Farmers requests for new skilled services

The new sensors placed on dairy cows can provide the high data rate monitoring of feeding, rumination, activity and body temperature in order to produce early detection of reproduction events and health disorders. The daily information of the farmer by SMS and Internet applications nevertheless confirms their requests for new skilled service offers.

Jean-Pierre
Lemonnier -FR

Herd performance benchmarks: graphic presentations of dairy farm performance relative to cohort herds

AgSource is releasing a new product, the Herd Report Card. It graphically shows herd performance in key areas of dairy farm management relative to selected cohort herds in the AgSource database. This adds further value to AgSource's milk recording services by presenting information available only from a multi-herd data set.

Peter D.
Giacomini - US



SESSION 5

New approaches in management of recording activities : how to demonstrate benefits of herd recording ? how to make our business attractive ?

Software offer from French farmers' organizations to support livestock activities

Different kinds of information systems are at the heart of cattle industry: collective data bases, cattle farm management information systems... French cattle organizations are frequently asked by cattle farmers or governmental organizations of other countries to provide them, with or without consultancy, solutions tailored to their needs and context. So they now are concerned to consider such requests, from a new software designing. France Genetique Elevage decided to support the initiatives of their cattle IT providers in order to make them properly address the foreign partners' needs. A survey of available software was made and their indexing is in progress. They may deal with bovine, ovine, and goats. They may concern animal identification and traceability, genetics, health and prophylaxis, farm management...For a single need, several specific proven solutions may be proposed. The offering may include prior consultancy services to local management and tools adapted to specific conditions.

René Rognant - FR

E. Rehben

Feedstuff NIR analysis in farm to growth herd recording activity

Herd recording can be valued in farm with nutrition. It's allowed by the new AgriNIR technology associated with the feeding-software Osmos'Rationneur. AgriNIR is an infrared analyzer for feedstuff, movable in farm. It supplies with immediate reliable nutrient values on the main grains and forages used in cattle breeding. These data and the recorded cow-performance are used by the adviser to establish diet formulations adapted to the breeder's objectives and to the potential of the herd. The moderate cost of analysis, the handiness of the tool and the immediate results facilitate the repetition of analysis. The objective is to fit the diet formulations to the results of every herd recording and to verify their impact with the following herd recording. It is an additional argument to promote herd recording in breeding.

Alberto Barbi - IT

Y. Martinot

SESSION 5

New approaches in management of recording activities : how to demonstrate benefits of herd recording ? how to make our business attractive ?



Global Management of Milk Recording Service with FIDOCL

To harmonize their milk recording service, the area FIDOCL (including 15 advice agencies in South-East of France) has developed a global project taking into account the following elements:

- Electronic Identification of animals (RFID)
- Electronic Identification of washable vials (RFID)
- Adaptation of tools for milk recording organization

By means of a PDA, the operations of milk control performance will be realized but also the management of the schedules and the agent in the farms.

The identification of cattle and the washable vial RFID will be provided in order to have full traceability.

The presentation will describe this new harmonization for the milk recording and benefit to the farmer at the heart of this system.

Jean-Marie
Nicolas -FR



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POSTERS - Session 5



New approaches in management of recording activities : how to demonstrate benefits of herd recording ? how to make our business attractive ?

DNA mastitis testing as a management tool

This presentation will show how the veterinarians and dairy producers work together using the DNA Mastitis tool PathoProof from Thermo Fisher Scientific. Explain the techniques used by the veterinarian using SOP's for the dairy producers with certain types of mastitis. Show how using the DHIA Milk Laboratory SCC report improves the chance to treat the infected cow more accurately. Show the types of educational papers used to train the dairy producer and also the DHIA Field technician. Show how this has helped between and changed how the dairy producer looks at mastitis management.

Jere High - US

Monthly milk records: the basis of a new valued extension services for an efficient management

Dairy herd extension services supplied by the French milk recording organizations are based on raw data collected monthly (milk, fat and protein percentage, somatic cell count). Until now, the monitoring software do not quantify the impact of factors explaining the observed performance such as age, month of calving, length of dry period, gestation, genetic level and measure of the production environment effect: the Herd Test-Day (HTD). All these factors are the main levers to adjust herd management. Now, their estimates from test-day model evaluations can be used in a new generation of extension services software. Four main applications are planned: to forecast animal (or herd) production, to compare predicted HTD with real ones, to simulate the impact of management changes (eg. Calving period, age of first calving, length of dry period...), to highlight the herd management strengths and weaknesses through its HTD pattern, comparing it to those obtained in a reference group. HTD pattern analysis, i.e how HTD effect fluctuate over time, is related to short-term environmental effect. It can be used as an indicator of the herd management efficiency. HTD patterns clustering was established on 3 480 455 test-dates (since 2000) from 36154 farms. Ten clusters of HTD pattern ($R^2 = 66\%$) were identified and interpreted in terms of management from data of representative 934 farms.

Berenice Huquet - FR

*H. Leclerc
C. Lecomte
V. Ducrocq*

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